Curriculum Vitae

Kathleen Mulvaney

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EDUCATION

UNIVERSITY OF NORTH CAROLINA CHAPEL HILL — CHAPEL HILL, NC
PhD in Cell Biology — December 2016
Dissertation: Proteomic dissection of KEAP1/NRF2 signaling identifies novel pathway interactors

UNIVERSITY OF ROCHESTER — ROCHESTER, NY
Bachelors of Science in Biology — May 2010
Concentration in Molecular Genetics with Distinction in Research

POSITIONS

FRALIN BIOMEDICAL RESEARCH INSTITUTE OF VIRGINIA TECH — WASHINGTON, DC
Assistant Professor of Biomedical Sciences and Pathobiology — October 2022-Present
Assistant Professor of Biomedical Engineering

- Research focus on targeting enzyme-substrate interactions for therapeutic development in cancer
- Therapeutically targeting PRMT5 in CDKN2A/MTAP null solid cancers

CHILDREN'S NATIONAL HOSPITAL — WASHINGTON, DC
Affiliate Member, Cancer and Immunology Research Center — October 2022-Present

- Research focus on targeting enzyme-substrate interactions for therapeutic development in cancer

ATRIUM WAKE FOREST BAPTIST COMP. CANCER CNTR — WAKE FOREST, NC
Member — February 2023-Present

- Therapeutically targeting PRMT5 in CDKN2A/MTAP null pediatric and adult cancer

THE BROAD INSTITUTE; DANA FARBER CANCER INST. — CAMBRIDGE, MA
HARVARD UNIVERSITY
Postdoctoral Fellow with Dr. William (Bill) Sellers — June 2017-September 2022

- Research focus on targeting protein-protein interactions for therapeutic development in cancer
- Therapeutically targeting PRMT5 on a novel binding interface in pancreatic cancer
- Led a productive team of 2-3 research associates funded by NIH and Deerfield Management support
- Collaborated with the Center for Development of Therapeutics to complete drug discovery project
- Culminated in two research publications and one patent

UNIVERSITY OF NORTH CAROLINA CHAPEL HILL — CHAPEL HILL, NC
Graduate Student with Dr. Ben Major — Spring 2011-June 2017

- Research focus on the KEAP1-NRF2 signaling pathway in cancer
- Described a function for KEAP1 in cell cycle regulation through ubiquitylation of MCM3
- Proteomic screening identified novel NRF2 interacting proteins and transcriptional regulators
- Culminated in successful defense of PhD, four research papers, and a review article

UNIVERSITY OF ROCHESTER ROCHESTER, NY
Lab Assistant with Dr. Shawn Murphy February 2007 – May 2009

- Research Focus on Diffuse Large B-Cell Lymphoma and expression of MHC Class II and CIITA with the underlying goal of identifying the association between expression levels and patients' immunological responses to DLBCL tumors
- Culminated in writing and successful defense of senior thesis and two co-authored manuscripts

PUBLICATIONS

1. **Kathleen Mulvaney**. Early clinical success of MTA-cooperative PRMT5 inhibitors for the treatment of CDKN2A/MTAP deleted cancers. *Cancer Discovery*. **13**, 2310–2312 (2023). PMID: 37909092. Invited submission.
2. **Mulvaney, KM**; Blomquist, C; Acharya, N; Li, R; Ranaghan, MJ; O'Keefe, M; Rodriguez, DJ; Young, MJ; Kesar, D; Pal, D; Stokes, M; Nelson, AJ; Jain, SS; Yang, A; Mullin-Bernstein, Z; Columbus, J; Bozal, FK; Skepner, A; Raymond, D; … Sellers, WR. Molecular basis for substrate recruitment to the PRMT5 methylosome. *Molecular Cell.* 2021, 81(17)17, P3481-3495.
3. McKinney, DC; McMillan, BJ; Ranaghan, MJ; Moroco, JA; Brousseau, M; Mullin-Bernstein, Z; O'Keefe, M; McCarren, P; Mesleh, M; **Mulvaney, KM**; Robinson, F; Singh, R; Bajrami, B; Wagner, FF; Hilgraf, R; Drysdale, MJ; Campbell, AJ; Skepner, A; Timm, DE; Porter, D; Kaushik, VK; Sellers, WR; Ianari, A. Discovery of a First-in-Class Inhibitor of the PRMT5–Substrate Adaptor Interaction. *Journal of Medicinal Chemistry.* 2021, 64 (15), 11148-11168.
4. Song, S; Nguyen, V; Schrank, T; **Mulvaney, KM**; Walter, V.; Wei, D.; Orvis, T.; Desai, N.; Zhang, J.; Hayes, DN; Zheng, Y.; Major, MB; Weissman, B. Loss of SWI/SNF chromatin remodeling alters NRF2 signaling in non-small cell lung carcinoma. *Mol Cancer Res*. 2020, Dec; 18(12):1777-1788.
5. Bowman BM; Montgomery SA Schrank TP, Simon JM, Ptacek TS, Tamir TY, **Mulvaney KM**, Weir SJ, Nguyen TT, Murphy RM, Makowski L, Hayes DN, Chen XL, Randell SH, Weissman BE, Major MB. A conditional mouse expressing an activating mutation in NRF2 displays hyperplasia of the upper gastrointestinal tract and decreased white adipose tissue. *J Pathol.* 2020 Oct;252(2):125-137.
6. **Mulvaney, KM.**; Matson, J.; Siesser, P.; Tamir, TY; Goldfarb, D.; Jacobs, T.; Cloer, EW; Cook, JG; Major, MB. Identification and Characterization of MCM3 as a KEAP1 Substrate. *Journal of Biological Chemistry*, 2016 Nov 4; 291(45): 23719–23733.
7. Tamir, TY*; **Mulvaney, KM***; Major, MB. Dissecting the Keap1/Nrf2 pathway through proteomics. *Current Opinion in Toxicology*, (*equal contribution) 2016, 1:118-24.
8. Guntas, G; Lewis, S; **Mulvaney, KM**; Cloer, E; Tripathy, A; Lane, T; Major, MB; Kuhlman, B. Engineering a genetically encoded competitive inhibitor of the KEAP1-NRF2 interaction via structure- based design and phage display. *Protein Eng Des Sel.* 2016 Jan;29(1):1-9.
9. Hast, BE; Goldfarb D*; **Mulvaney KM***; Hast MA; Siesser PF; Yan F; Hayes DN; Major MB. Proteomic analysis of ubiquitin ligase KEAP1 reveals associated proteins that inhibit NRF2 ubiquitination. *Cancer Research.* 2013 1;73(7):2199-210. (*equal contribution)
10. Cycon, KA; **Mulvaney, KM**; Rimsza, LM; Persky, D.; Murphy, SP. Histone deacetylases (HDACs) contribute to the silencing of CIITA expression in DB diffuse large B cell lymphoma. *Immunology*. 2013 Oct; 140(2): 259–272.
11. Bushway, M.; Cycon, KA; **Mulvaney, KM**; Murphy, SP. Coordinate loss of MHC class II expression in the diffuse large B cell lymphoma cell line OCI-Ly2 is due to a novel mutation in RFX-AP. *Immunogenetics*. 2010, 62(2):109-16.

PATENTS

1. Arthur Campbell, Martin Drysdale, Robert Hilgraf, Alessandra Ianari, Patrick McCarren, David

McKinney, Brian McMillan, **Kathleen Mulvaney**, Dale Porter, William Sellers, Ritu Singh, Florence Wagner. Co-inventor, PCT Application Serial No. PCT/US2021/045016, filed on August 6, 2021 and entitled, "Substrate Adaptor Inhibitors of PRMT5 and Uses Thereof". (inventors listed alphabetically)

AWARDS AND FUNDING

- NIH R35 MIRA Grant Award: 1R35GM154987-01 (2024-2029)
- Children's Cancer Foundation Grant (2024)
- Focused Ultrasound Foundation Pilot Grant (2024)
- Seale Innovation Pilot Grant (2023)
- NIH F32 Ruth L. Kirschstein Postdoctoral Individual National Research Service Award (2018-2021)
- NIH LRP Award (2019-2021)
- Sigma Xi Research Society Graduate Student Travel Award (2015)
- National Science Foundation Graduate Research Fellowship Honorable Mention (2011, 2012)
- Degree with Distinction in Research: an honor awarded by the University of Rochester (2009)
- National Science Foundation David T. Kearns Scholar (2008-2010)
- Take Five Scholar: Awarded tuition-free fifth year by the University of Rochester to study "Influences on Cognitive and Personality Development" (2009- 2010)
- Academic Competitiveness Grant awarded by New York State (2007- 2008)
- International Baccalaureate Scholar awarded as a four-year merit scholarship (2005- 2009)

PRESENTATIONS

NATIONAL MEETINGS

FASEB Biological Methylation Conference **February 2023**

- Presented "PRMT5 as a therapeutic target in CDKN2A/MTAP null cancer" invited talk

FASEB Biological Methylation Conference **June 2022**

- Presented "PRMT5 as a therapeutic target in CDKN2A/MTAP null cancer" talk

AACR Annual Meeting **April 2022**

- Presented "Resolving substrate recruitment to the PRMT5 methylosome" invited seminar

AACR Annual Meeting **April 2016**

- Presented "KEAP1 ubiquitinates MCM3 to regulate cell cycle in cancer" poster

FASEB Ubiquitin Conference **June 2014**

- Presented "KEAP1 ubiquitinates MCM3" poster to the ubiquitin-proteasome signaling community

DANA FARBER HARVARD CANCER CENTER

Mass. General Hospital Postdoc Association Invited Seminar **February 2022**

- Presented "Drugging Enzymes in Cancer" to a general audience, invited seminar

Ludwig Meeting Invited Seminar **July 2021**

- Presented "Resolving substrate recruitment to the PRMT5 methylosome" invited seminar

Molecular and Cellular Oncology Retreat **June 2019**

- Awarded Best Poster Presentation: "PRMT5-substrate adaptor interface as a novel therapeutic target in MTAP null tumors"

BROAD INSTITUTE

Lunch and Learn **July 2019**

- Co-led department-wide invited chalk talk: "Opportunities and challenges in following up cancer dependencies: lessons learned from PRMT5 and NXT1"

UNIVERSITY OF NORTH CAROLINA CHAPEL HILL

University Research Day **March 2015**

- Awarded Best Oral Presentation

IMSD Symposium **November 2014**
- Awarded Best Oral Presentation

UNIVERSITY OF ROCHESTER
Office of Admissions **December 2008**
- Invited to present regionally to prospective students on undergraduate research opportunities

TEACHING EXPERIENCE

VIRGINIA POLYTECHNIC INS. & STATE UNIVERSITY, BLACKSBURG, VA
Graduate Student Mentoring **Spring 2023**
- Mentoring Virginia Tech TBMH students rotating in the lab in critical thinking and scientific research

Lecturer **Spring 2023**
- Presented lecture on defining novel therapeutic targets in cancer in Graduate Cancer Focus Class

HARVARD UNIVERSITY, CAMBRIDGE, MA
BIOS E-30 Epigenetics & Gene Regulation
Teaching Assistant and Guest Lecturer **Fall 2020, Fall 2021**
- Led weekly independent recitation and study sections, guided and graded the writing assignments
- Teaching 2 lectures per seminar on cancer epigenetics (2021)

BIOS E-16 Cell Biology
Teaching Assistant **Spring 2019; Spring 2021**
- Led weekly independent recitation and study sections
- Guided and graded the writing assignments, problem sets, and exams

BROAD INSTITUTE, CAMBRIDGE, MA
Graduate Student Mentoring **September 2017-Present**
- Mentoring Harvard BBS students rotating in the lab in critical thinking and scientific research

Research Associate Mentoring **June 2017-Present**
- Mentoring and promoting the career development of three post-undergraduate researchers in the lab.

UNIVERSITY OF NORTH CAROLINA, CHAPEL HILL, NC
Science-at-Hand **October 2014-May 2017**
- Give monthly scientific demonstrations and discuss careers in science with high school students.

Undergraduate Mentoring **January 2014- May 2017**
- Mentoring two undergraduate researchers on research projects for credit in the Major Lab.

First Year Group **Fall 2014**
- Peer mentor to first year students, advise on lab rotations and giving scientific presentations.

North Carolina DNA Day **April 2011; April 2013**
- Taught high school students about pharmacogenomics and encouraged exploring careers in science.

LABORATORY TECHNIQUES

PROTEOMICS: Experience with purification of protein complexes for identification by mass

spectrometry (affinity, immunoprecipitation and BioID), isolation and detection of whole cell and targeted post-translational modifications (phosphorylation, ubiquitylation, methylation) by mass spectrometry, and analysis and visualization of mass spectrometry data (MaxQuant, Proteome Discoverer, Skyline, Spotlite, Cytoscape).

GENOMICS, SCREENING AND NEXT-GEN SEQUENCING: Experience with single and digenic CRISPr knockout screens, small molecule screening, RNA-seq, library generation, and Illumina sequencing.

MOLECULAR BIOLOGY & BIOCHEMISTRY: Experience with mammalian cell culture (primary and immortalized), RNA and DNA isolation, qPCR, RNA-seq, genetic manipulation including CRISPr, cloning and site-directed mutagenesis, flow cytometry, fluorescence activated cell sorting, chromatin immunoprecipitation, luciferase reporter assays, drug treatments and viability and proliferation assays, protein expression and purification, Western blotting, fixed and live-cell light and fluorescence microscopy, proximity ligation assays, mouse handling, MEF line derivation, subcutaneous xenografts, recombinant protein purification, size exclusion chromatography, and cellular and *in vitro* binding and ubiquitylation and methylation assays.

PROFESSIONAL MEMBERSHIPS

American Association for Cancer Research (AACR) (2016-present)
American Association for the Advancement of Science (AAAS) (2015-present)

JOURNAL REVIEWER

Molecular Cancer Research (2019-present)
PLOS One (2023-present)